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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
D04H 1/72, B27N 3/14, D21H 27/00 | **A1**

(11) International Publication Number: **WO 99/54537**

(43) International Publication Date: 28 October 1999 (28.10.99)

(21) International Application Number: PCT/DK99/00221

(22) International Filing Date: 20 April 1999 (20.04.99)

(30) Priority Data:
0555/98 21 April 1998 (21.04.98) DK

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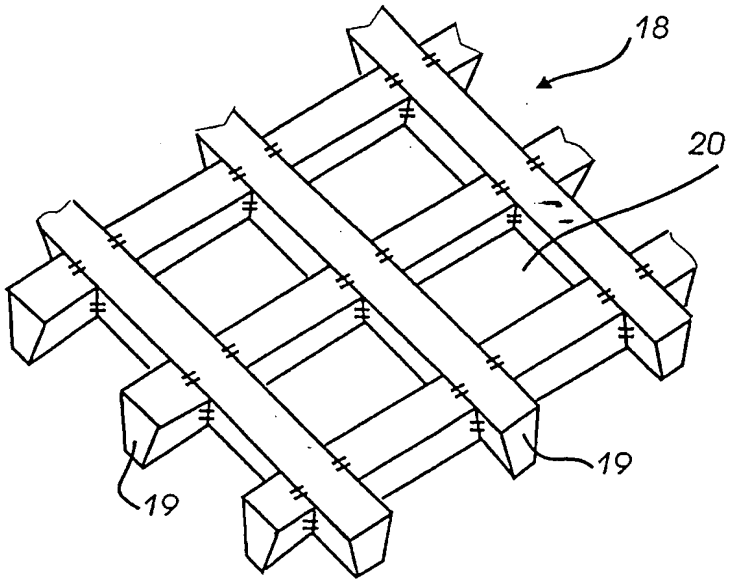
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
In English translation (filed in Danish).

(54) Title: SIFTING NET FOR A FIBRE DISTRIBUTOR



(57) Abstract

A fibre distributor (1) forms an air-laid fibre web (17) on a running endless forming wire (2) which, during operation, in principle is horizontal. The fibre distributor comprises a suction unit (14) positioned under the forming wire, a housing (3) positioned above the forming wire and having at least one combined fibre and air inlet (4), and a base (6) having a number of flow openings (7), and a number of rotational wings (10) positioned above this base. These wings distribute the fibres along the upper side of the base. The base is designed as a grid (18) with grid bars (19) which taper in a downwards direction. In the flow openings (20) of the grid, a slip is advantageously formed which prevents the fibres from packing together and blocking the openings during operation. The fibre distributor is thus, at a continuous high capacity, able to form an even and homogenous fibre layer on the forming wire.

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Sifting net for a fibre distributor

The invention relates to a fibre distributor for forming an air-laid fibre web on a running endless forming wire which, during operation, in principle is horizontal, comprising a suction unit positioned under the forming wire, a housing positioned above the forming wire, and having at least one fibre inlet, and a base having a number of flow openings, and a number of rotational wings positioned above this base for distributing the fibres along the upper side of the base.

Such a fibre distributor is used extensively in systems where the fibre layer on the forming wire is subsequently subjected to a number of processes which convert the fibre layer to a continuous web in the form of, for example, paper and synthetic paper materials of the kind typically used for the production of various paper products and hygienic articles.

The fibres are fed to the fibre housing via the fibre inlet and are driven in a flow over the upper side of the base by the wings which, during operation, rotate in such a way that the fibres are evenly distributed over the total area of the base.

At the same time, the suction unit generates an air flow through the openings in the base and the forming wire. This air flow successively pulls fibres with it down through the openings in the base. As the openings in the forming wire are smaller in size than the openings in the base, the majority of these fibres lie in a desiredly even layer on the upper side of the forming wire, or on a fibre layer formed in advance on the forming wire. The forming wire continuously carries the fibre layer on to the following processes mentioned above.

The base comprises conventionally a net with a quadratic mesh. When the fibres comprise of, or contain, short cellulose fibres, the mesh must be dimensioned with a correspondingly

small mesh aperture. A fibre distributor such as this therefore has a comparatively small capacity.

One proposal to solve this problem is disclosed in U.S. patent no. 4,355,066. This patent describes a fibre distributor for forming short-fibred cellulose pulp on a forming wire via a rectangularly meshed base net. Thus, each flow opening in this known base net has both a small and a large dimension, which means that the flow area of the individual flow openings and thus the capacity of the net is increased correspondingly.

For reasons of economy and strength, a mixture of cheap cellulose fibres and more expensive, but longer synthetic fibres are often used to produce fibre web.

The base net is influenced by the differential pressure generated by the suction unit. This means that the thread of the base net must have a suitable thickness in order to resist the resulting comparatively large load. It has, however, become apparent that when using the rectangularly meshed net mentioned in U.S. patent no. 4,355,066, the short and long fibres become stuck and block the net openings when passing through the narrow gap between the thick thread of this net. The long synthetic fibres also tend to get wound up in the thread of the net. This means that the fibre distributor is periodically out-of-service, and that the structure of the fibre layer on the forming wire is very uneven.

The object of the invention is to provide a fibre distributor of the kind mentioned in the opening paragraph, which, even with a mixture of short and long fibres and at high capacity, can constantly form a more even and homogenous fibre layer on the forming wire than is possible today.

The novel and unique features according to the invention whereby this is achieved is the fact that the flow openings of

the base are defined by partitions which diverge in a downwards direction. The consequent slip created in the openings of the base thus efficiently prevents the fibres from becoming stuck.

Each opening can, for example, have a quadratic or rectangular area. In both cases, the same considerable advantage can be obtained, in that the fibres do not get caught and do not block the openings.

Depending on the structure which the resulting fibre web is to have, and the character of the fibres used, two opposite sides of each of the openings can extend in the same direction as the transport direction of the forming wire or can, alternatively, form an angle to the forming wire.

In an especially advantageous embodiment, the base of the fibre distributor can be formed as a grid with grid bars, each grid bar having two sides which converge in a downwards direction and which each forms a partition in a flow opening. Such a grid can easily have sufficient strength to resist load from the differential pressure which the suction unit generates over the grid. The slip in the grid occurs because the grid bars, seen in the cross-section, are tapered from the upper side of the grid to the under side of the grid.

The grid can expediently be produced with crossed grid bars joined at the corners of the openings by, for example, welding or soldering.

Such joins can easily cause irregularities in the surface in which the fibres can become stuck. In order to eliminate this risk, the grid can be coated with, for example, Teflon. This Teflon will not only cover these irregularities but will also give the grid an even and smooth surface having a very low friction coefficient.

Thus, the considerable advantage is furthermore obtained in that the fibres will flow more easily over the upper side of the grid, thus improving distribution along this surface. The fibres will also be distributed more evenly. At the same time, the fibres will meet a minimum of resistance during their passage through the grid openings.

It should be noted that the same advantage can be achieved by coating a base which is not shaped like a grid, and that the openings do not necessarily have to be quadratic or rectangular but could just as well have any other suitable shape, for example, they could be rhombic.

The invention will be explained in greater details below, describing only an example of an embodiment where the advantageous characteristics and effects of the invention are stated with reference to drawing, in which:

Fig. 1 is a diagrammatic side elevational view of a fibre distributor according to the invention which is placed over a fragmentarily shown forming wire,

Fig. 2 is a plan view of the fibre distributor in fig. 1,

Fig. 3 is a perspective plan view of a fragment of the fibre distributor base grid illustrated in Figs. 1 and 2,

Fig. 4 is a cross-sectional view of a grid bar for the base grid in Fig. 3.

Fig. 5 shows the same grid bar, but with a coated surface, and

Fig. 6 shows a second embodiment of a base grid according to the invention.

In the following it is presumed that the fibre distributor according to the invention belongs to a system which produces paper web in the form of paper and synthetic paper materials of the kind typically used for various paper products and hygienic articles.

In Figs. 1 and 2, the fibre distributor 1 is placed at a comparatively short distance above a forming wire 2 which is part of the system.

The fibre distributor has a housing 3 with a combined fibre and air inlet 4, and a base 6 with a large number of evenly distributed flow openings 7. In the example shown, there are three rows of rotors 8 positioned above the base. In each row, there are eight rotors 8, each comprising a rotational vertical shaft 9 with a lower wing 10. During operation, the rotors are rotated via a drive unit (not shown).

Only the front end of forming wire 2 is shown. During operation, this runs with an upper wire part 11 and a lower wire part 12 over roller 13 in the direction indicated by the arrow. The forming wire comprises a net with a mesh which is fine enough to prevent a substantial amount of the fibre from passing through.

A suction box 14 is positioned under the upper wire part 11 of the forming wire. During operation, a vacuum pump 15 sucks air from this via an air conduit 16.

When the system is in operation, the vacuum pump 15 generates a negative pressure in suction box 14. The negative pressure is transmitted via the mesh in the upper wire part 11 of the forming wire 2, and the openings 7 of the base 6 to the housing 3. From here, fibre and air respectively are sucked into the housing via the combined fibre and air inlet 4. The air

continues in a flow through the openings of the base and the mesh of the forming wire down to suction box 14.

The rotors 8 set the fibres in flow across the upper side of base 6, along the paths indicated by the dotted lines. Thus, the fibres are distributed evenly over the total area of the base.

The air flow through the openings 7 of the base 6 successively rakes some of the fibres which run in flows along the upper side of the base down onto the forming wire 2, where the majority of the fibres remain because they are not able to penetrate the fine mesh of the forming wire. The upper path 11 of the forming wire 2 transports the formed fibre layer 17 further in the direction of the arrow for treatment in the following process stages of the system.

Fig. 3 fragmentarily shows a fibre distribution base in the form of a grid 18 which is welded together of crossed grid bars 19. These define the flow openings 20.

The grid bars must have sufficient resisting moment against bending in order to ensure that the grid in its entirety is strong enough to absorb load from the differential pressure over the grid which has been formed by the vacuum pump. In order to maintain the capacity of the fibre distributor at the required high level, the bars must be comparatively narrow so that they do not block too much of the total flow area of the grid. As the grid bars must have a comparatively large resisting moment, it is necessary for the bars to be comparatively tall.

The flow openings 20 therefore have the appearance of channels which the fibres must force on their passing between the upper and lower side of the grid. The fibres will, anything else the same, tend to pack and block such channel-shaped flow openings.

As shown in Fig. 4, each grid bar tapers in a downwards direction so that a slip is formed in the channel-shaped flow openings. This prevents the fibres from packing.

The two sides of the bars mutually form an angle of between 5 and 35° and especially between 10 and 25°. This provides a good slip and at the same time a strong bar.

A strong bar which, at the same time, blocks the flow area of the grid as little as possible, is also obtained in that the height of the bar is between 1 and 5 times greater than its width at the upper side of the grid. The advantage of such a narrow and tall grid bar profile is that it is impossible or at least very difficult for the long synthetic fibres to become entangled in the bars.

Fig. 5 shows an embodiment according to the invention where all of the grid bars 21 are coated with, for example, Teflon 22. This is to reduce the friction coefficient of the surface and also to smooth over any irregularities at e.g. the welds in the corners between the crossed bars.

Fig. 6 shows a variation 23 of the embodiment 18 shown in fig. 3. Here, the same grid bars 19 are used but in this case, they are placed above each other. With this design, the grid bars are easy to join together with spot welding. This design is especially suitable for grids having rectangular openings.

C L A I M S

1. A fibre distributor (1) for forming an air-laid fibre web (17) on a running endless forming wire (2) which, during operation, preferably is horizontal, and comprising a suction unit (14) positioned under the forming wire, a housing (3) positioned above the forming wire and having at least one fibre inlet (4), and a base (16) having a number of flow openings (7), and a number of rotational wings (10) positioned above this base for distributing the fibres along the upper side of the base, **characterised** in that the flow openings (7) of the base are defined by partitions diverging in a downwards direction.

2. A fibre distributor (1) according to claim 1 or 2, **characterised** in that the two opposite partitions in a flow opening together form an angle of between 5 and 35° and especially between 10 and 25°.

3. A fibre distributor (1) according to claim 1, 2, or 3, **characterised** in that each opening has a quadratic area.

4. A fibre distributor (1) according to claim 1, 2, or 3, **characterised** in that each opening has a rectangular area.

5. A fibre distributor (1) according to any of the claims 1 - 4, **characterised** in that two of the opposite sides of each opening are extending mainly parallel with the transport direction of the forming wire (2).

6. A fibre distributor (1) according to any of the claims 1 - 4, **characterised** in that two of the opposite sides of each opening forms an angle with the transport direction of the forming wire (2).

7. A fibre distributor (1) according to any of the claims 1 - 6, **characterised** in that the base (6) is a grid (18) having grid bars (19), each having two sides converging in a downwards direction and each forming a partition in a flow opening (7).

8. A fibre distributor (1) according to claim 7, **characterised** in that the height of each grid bar (19) is between 1 and 5 times greater than its width at the upper side of the grid (18).

9. A fibre distributor (1) according to claim 7 or 8, **characterised** in that the crossed grid bars are joined at cross points by for example, welding or soldering.

10. A fibre distributor (1) according to any of the claims 1 - 9, **characterised** in that the base (6) is coated with, for example, Teflon.

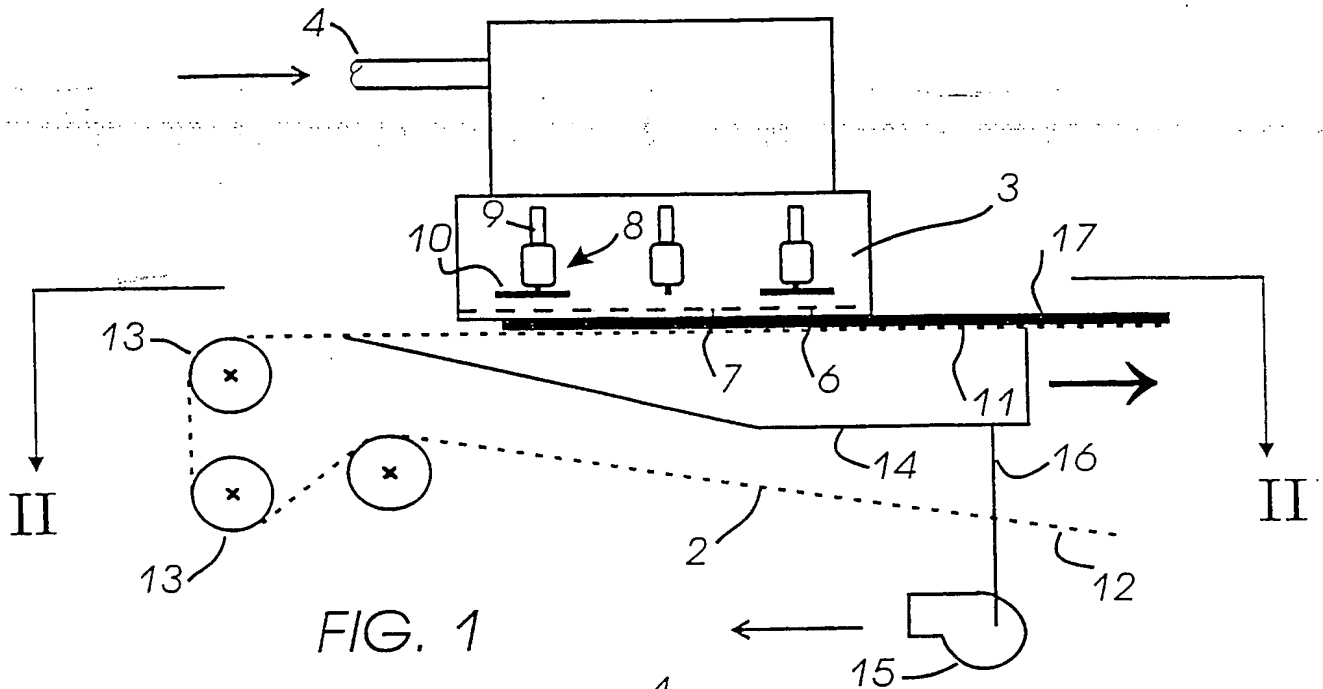

FIG. 1

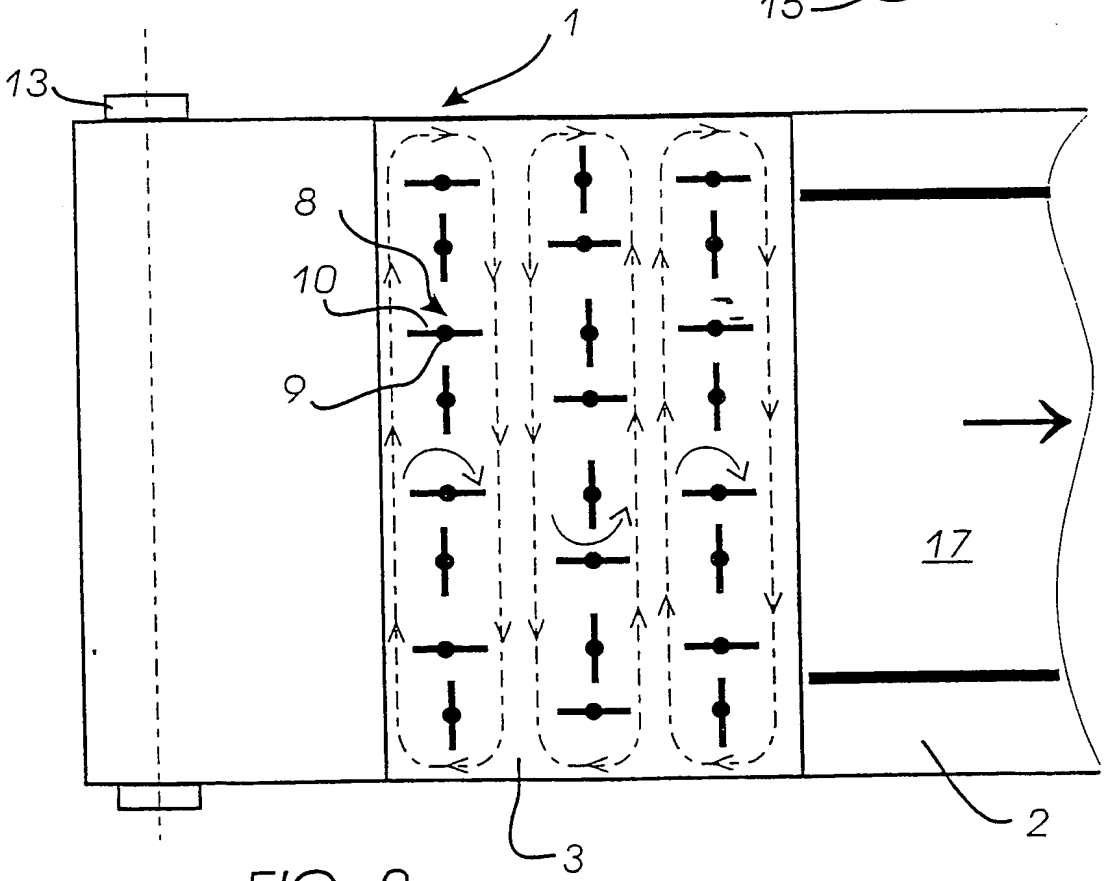

FIG. 2

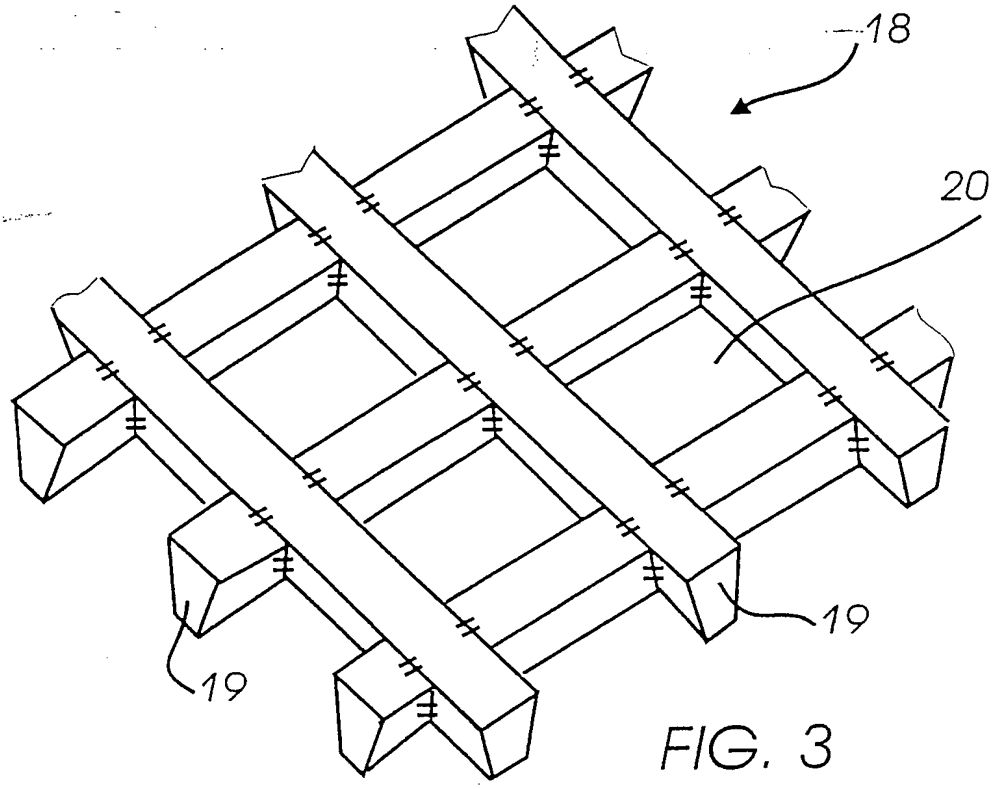

FIG. 3

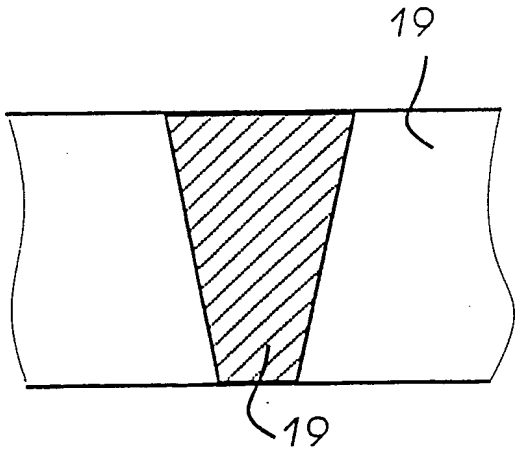

FIG. 4

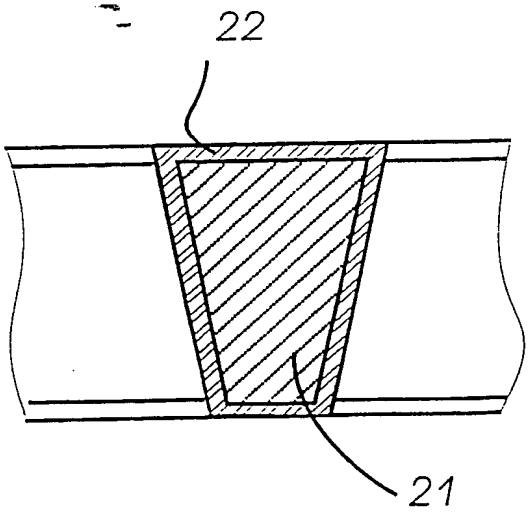

FIG. 5

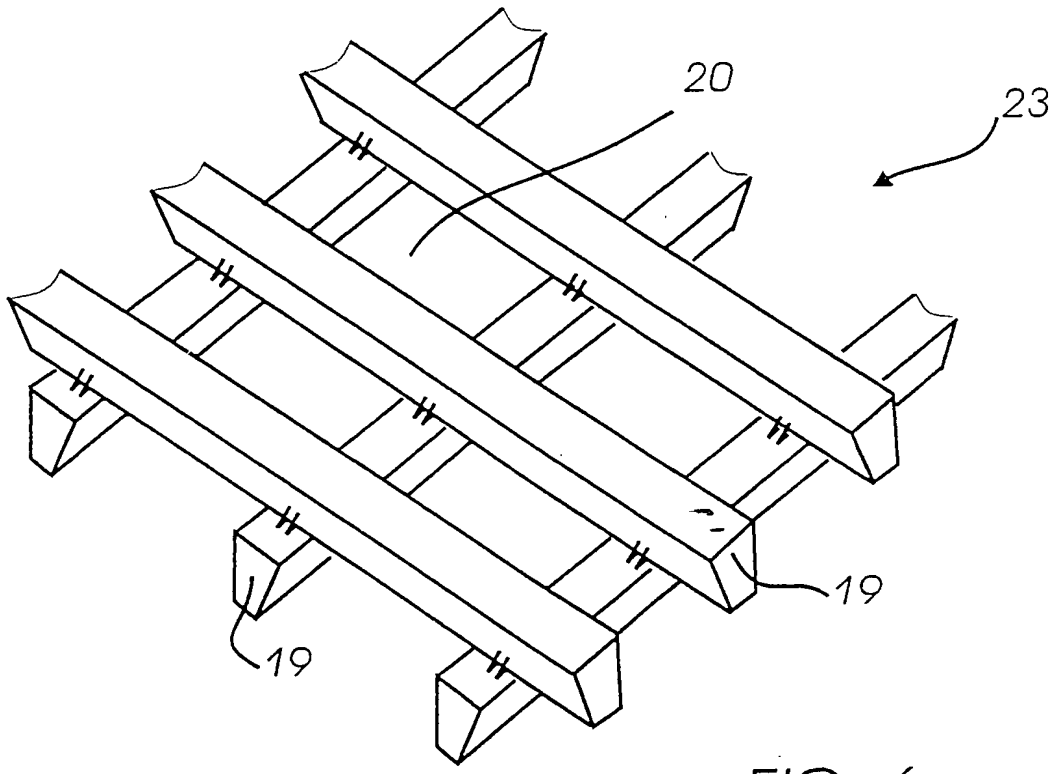

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 99/00221

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D04H 1/72, B27N 3/14, D21H 27/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B27N, D01G, D04H, D21H

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SE,DK,FI,NO classes as above

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0226939 A2 (KIMBERLY-CLARK CORPORATION), 1 July 1987 (01.07.87), page 20; page 30 - page 31, figures 6,10C, see especially page 30, line 31 - page 31, line 1 --	1-10
A	US 5471712 A (KARL K. K. KROYER), 5 December 1995 (05.12.95), column 1, line 61 - column 2, line 16, figures 1,4, claim 1 --	1-10

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

01/07/99

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